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Self-interaction in Bopp-Podolsky electrodynamics: Spacetimes with angular defects

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Abstract

© 2016 American Physical Society.We consider the self-interaction phenomenon in the framework of the Bopp-Podolsky electrodynamics. In the present paper, we obtain the self-interaction potential energy of a charge at rest for the spacetimes with topological defects of two types: for the axially symmetric spacetime of the straight cosmic string and the spherically symmetric global monopole spacetime. It is shown that the behavior of this expression depends essentially on the angular defect, in spite of the Bopp-Podolsky model parameter, which plays the role of a scale factor. In contrast with the usual Maxwell electrodynamics, the self-interaction energy for the Bopp-Podolsky electrodynamics appears to be finite everywhere and the standard renormalization procedure is not required.

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